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COVID-19 Vaccines

The charts below provide dosing, storage, adverse effects, efficacy, and other information for COVID-19 vaccines approved or authorized in the US and Canada. The American Society of Health System Pharmacists has resources related to COVID-19 vaccines at <https://www.ashp.org/COVID-19/Vaccines?loginreturnUrl=SSOCheckOnly>. See end of the chart for links to the **fact sheets** and **product labeling**.

COVID-19 Vaccines Available in the UNITED STATES

VACCINE ^e	DOSE (Primary Series)	DOSE (Booster)	STORAGE/STABILITY	COMMENTS
<p>BNT162b2 (Pfizer-BioNTech)/ mRNA (Comirnaty)^c</p> <p>PURPLE cap^{*,17,19} (NOT for ages <12 years^a)</p> <p>Approved for ages ≥12 years;¹⁹ EUA for ages ≥12 years; third dose for immunocompromised.^{f,17}</p> <p>Requires dilution with 1.8 mL NS per vial.^{17,19}</p> <p>*Purple cap formulation is being phased out. See Gray cap formulation, below.</p>	<p>Primary vaccination for ≥12 years: two 0.3 mL (30 mcg) IM doses 3 weeks apart.^{**17,19}</p> <p>Immunocompromised^f: As above, plus 3rd dose ≥28 days after the 2nd dose.¹⁷</p> <p>**CDC: An 8-week interval between the first two doses may increase efficacy, but stick with labeled interval for those who need rapid protection (e.g., age ≥65 years, immunocompromised).²⁵</p>	<p>See age- appropriate bivalent mRNA booster.</p>	<p>Shipping/long-term storage (ultra-low temp freezer, freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C): one month thawed/undiluted vials (includes transport [up to 12 hours]); 6 hours once diluted (vial or pre-drawn syringe).^{10,17,19}</p> <p>Room Temp (up to 25°C): 2 hours (thawed/undiluted); 6 hours once diluted (vial or pre-drawn syringe).^{10,17,19}</p>	<ul style="list-style-type: none"> • Efficacy: In adolescents, 43% effective against hospitalization 2 to 22 weeks after second dose (Omicron BA.1-predominant period).³⁶ Also see footnote i. • Lymphadenopathy (16%) may interfere with imaging (e.g., mammography) for four to six weeks after vaccination.²⁸ • See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about myocarditis/pericarditis.

VACCINE ^e	DOSE (Primary Series)	DOSE (Booster)	STORAGE/STABILITY	COMMENTS
<p>BNT162b2 (Pfizer-BioNTech)/ mRNA (Comirnaty)^c</p> <p>GRAY cap^{13,27} (NOT for ages <12 years^a)</p> <p>Approved for ages ≥12 years;²⁷ EUA for ages ≥12 years; third dose for immunocompromised.^f</p> <p>Do NOT dilute.^{13,27}</p>	See above.	See above.	<p>Shipping/long-term storage (ultra-low temp freezer, freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C): 10 weeks (unpunctured vial); 12 hours (pre-drawn syringe).^{10,13,27}</p> <p>Room Temp (up to 25°C): 12 hours (unpunctured vial or pre-drawn syringe).^{10,13,27}</p> <p>Discard vials 12 hours after first puncture.^{13,27}</p> <p>Vaccine should not be used after 18 months from date of manufacture.¹³</p>	See above.
<p>BNT162b2 for 5 through 11 years of age (Pfizer-BioNTech)/ mRNA</p> <p>ORANGE cap and label with orange border³⁰</p> <p>EUA</p> <p>Requires dilution with 1.3 mL of NS per vial.³⁰</p>	<p>Primary vaccination for 5 to 11 years: two 0.2 mL (10 mcg) IM doses 3 weeks apart.³⁰</p> <p>Immunocompromised: as above, plus 3rd dose ≥28 days after the second dose.³⁰</p>	See age-appropriate bivalent mRNA booster.	<p>Shipping/long-term storage (ultra-low temp freezer, freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C) (option if vials arrive frozen or refrigerated): 10 weeks undiluted; 12 hours once diluted (vial).³⁰</p> <p>Room Temp (up to 25°C): 12 hours (undiluted); 12 hours once diluted (vial).³⁰</p> <p>Stable in pre-drawn syringe for 24 hours, with no more than 12 hours at room temperature (up to 30°C).¹⁰</p> <p>Vaccine should not be used after 18 months from date of manufacture.³⁰</p>	<ul style="list-style-type: none"> • Efficacy 68% against hospitalization about one month after the second dose (Omicron BA.1-predominant period).³⁶ Also see footnote i. • See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about myocarditis/pericarditis.

VACCINE ^e	DOSE (Primary Series)	DOSE (Booster)	STORAGE/STABILITY	COMMENTS
<p>BNT162b2 for 6 months through 4 years of age (Pfizer-BioNTech)/ mRNA</p> <p>MAROON cap and label with maroon border³²</p> <p>EUA</p> <p>Requires dilution with 2.2 mL of NS per vial.³²</p>	<p>Primary vaccination for 6 months to through 4 years: three 0.2 mL (3 mcg) IM doses. The initial two doses are given 3 weeks apart, followed by a third dose (USING THE BIVALENT vaccine) ≥8 weeks after the second dose.³²</p>	N/A	<p>Shipping/long-term storage (ultra-low temp freezer, freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C) (option if vials arrive frozen or refrigerated): 10 weeks (undiluted); 12 hours (once diluted).³²</p> <p>Room Temp (up to 25°C): 12 hours (undiluted); 12 hours (once diluted; vial or pre-drawn syringe).^{10,32}</p> <p>Vaccine should not be used after 18 months from date of manufacture.³²</p>	<ul style="list-style-type: none"> Immune response in this age group is similar to that of people 16 through 25 years of age.³² Also see footnote i. See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about myocarditis/pericarditis.
<p>Pfizer BioNTech Bivalent for 6 months through 4 years of age (Pfizer-BioNTech)/ mRNA</p> <p>MAROON cap and label with maroon border³²</p> <p>EUA</p> <p>Requires dilution with 2.2 mL of NS per vial.³²</p>	<p>Third dose of primary series (6 months through 4 years of age): one 0.2 mL (3 mcg) IM dose ≥8 weeks after the second dose of the primary series.³²</p>	N/A	<p>Shipping/long-term storage (ultra-low temp freezer, freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C) (option if vials arrive frozen or refrigerated): 10 weeks (undiluted); 12 hours (once diluted).³²</p> <p>Room Temp (up to 25°C): 12 hours (undiluted); 12 hours once diluted.³²</p> <p>Vaccine should not be used after 18 months from date of manufacture.³²</p>	<ul style="list-style-type: none"> Approval based on immunogenicity data from a different bivalent booster (original and Omicron BA.1) in individuals >55 years of age.³² Also see footnote i. See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about myocarditis/pericarditis.
<p>Pfizer BioNTech Bivalent booster for ≥12 years of age (original and Omicron BA.4/BA.5) (Pfizer-BioNTech)/ mRNA</p> <p>EUA</p> <p>Do NOT dilute.³⁸</p>	N/A	<p>Booster (≥12 years of age): one 0.3 mL IM dose ≥2 months after completion of primary series of any COVID-19 vaccine or booster.³⁸</p>	<p>Shipping/long-term storage (ultra-low temp freezer, freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C) (option if vials arrive frozen or refrigerated): 10 weeks (undiluted); 12 hours (in-use vial).³⁸</p> <p>Room Temp (up to 25°C): 12 hours prior to first puncture; 12 hours (in-use vial).³⁸</p> <p>Vaccine should not be used after 18 months from date of manufacture.³⁸</p>	<ul style="list-style-type: none"> Approval based on immunogenicity data from a different bivalent booster (original and Omicron BA.1) in individuals >55 years of age.³⁸ Also see footnote i.

VACCINE ^e	DOSE (Primary Series)	DOSE (Booster)	STORAGE/STABILITY	COMMENTS
<p>Pfizer-BioNTech Bivalent booster for 5 through 11 years of age (original and Omicron BA.4/BA.5) (Pfizer-BioNTech)/ mRNA</p> <p>EUA</p> <p>Requires dilution with 1.3 mL of NS per vial.³⁷</p>	N/A	<p>Booster (5 through 11 years of age): one 0.2 mL IM dose ≥ 2 months after completion of primary series of any COVID-19 vaccine or booster.³⁷</p>	<p>Shipping/long-term storage (ultra-low temp freezer, freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C) (option if vials arrive frozen or refrigerated): 10 weeks (undiluted); 12 hours (once diluted).³⁷</p> <p>Room Temp (up to 25°C): 12 hours (undiluted); 12 hours (once diluted).³⁷</p> <p>Vaccine should not be used after 18 months from date of manufacture.³⁷</p>	<ul style="list-style-type: none"> Approval based on immunogenicity data from a different bivalent booster (original and Omicron BA.1) in individuals >55 years of age.³⁷ Also see footnote i.
<p>mRNA-1273 (Moderna)/ mRNA (Spikevax)^g</p> <p>RED cap and label with a light blue border (0.2 mg/mL)²¹</p> <p>Approved (Spikevax) for primary two-dose series in adults ≥ 18 years of age.²¹</p> <p>EUA for primary series for ages 12 to 17 years of age, and a third primary series dose for immunocompromised people ≥ 12 years of age.²</p> <p><i>Continued...</i></p>	<p>Primary vaccination for ≥ 12 years: two 0.5 mL (100 mcg) IM doses one month (4 weeks) apart.*^{2,21,25}</p> <p>Immunocompromised: as above plus 3rd dose ≥ 1 month (≥ 4 weeks) after the second dose.^{2,25}</p> <p>*CDC: An 8-week interval between the first two doses may increase efficacy, but stick with labeled interval for those who need rapid protection (e.g., age ≥ 65 years, immunocompromised).²⁵</p>	<p>See age-appropriate bivalent booster.</p>	<p>Shipping/long-term storage (freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C): 30 days after thawing (prior to first use).^{2,21} After 30 days, contact manufacturer for guidance before discarding.⁶ In-use vial/pre-drawn syringe: 12 hours.^{2,10,21}</p> <p>Room temperature (8°C to 25°C): 24 hours total. Discard 12 hours after first puncture.^{2,21} Pre-drawn syringe: 12 hours after first puncture of source vial.¹⁰</p>	<ul style="list-style-type: none"> Efficacy: In children 12 through 17 years of age, 93.3% effective in preventing symptomatic infection (pre-Omicron data).² Also see footnote i. Lymphadenopathy (16%) may interfere with imaging (e.g., mammography) for four to six weeks after vaccination.²⁸ See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about myocarditis/pericarditis. Delayed-type hypersensitivity reaction (e.g., large, red area near injection site) reported most often about a week after first shot. May be itchy, painful, warm, or swollen,

VACCINE ^e	DOSE (Primary Series)	DOSE (Booster)	STORAGE/STABILITY	COMMENTS
<i>Spikevax</i> , continued				and can also involve fingers, elbow, or palm. Not a contraindication to subsequent vaccination. ¹⁵
mRNA-1273 (Moderna)/ mRNA 50 mcg in 0.5 mL DARK blue cap and a label with a PURPLE/TEAL border ³⁴ (0.1 mg/mL) EUA for primary series (6 through 11 years). ³⁴	Primary vaccination for 6 through 11 years: two 0.5 mL (50 mcg) IM doses one-month apart. ³⁴ Immunocompromised: as above plus 3 rd dose ≥1 month after the second. ³⁴	See age-appropriate bivalent mRNA booster.	Shipping/long-term storage (freezer): See footnote d. Refrigerator (2°C to 8°C): 30 days after thawing (prior to first use). ³⁴ After 30 days, contact manufacturer for guidance before discarding. ⁶ In-use vial/pre-drawn syringe: 12 hours. ^{10,34} Room temperature (8°C to 25°C): 24 hours total. ³⁴ Discard 12 hours after first puncture. ³⁴ Pre-drawn syringe: 12 hours after first puncture of source vial. ¹⁰	<ul style="list-style-type: none"> • Immune response in children 6 through 11 years of age is similar to that of adults 18 to 25 years of age.³⁴ Also see footnote i. • See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about myocarditis/pericarditis.
mRNA-1273 for 6 months through 5 years of age (Moderna)/ mRNA DARK blue cap and label with a MAGENTA border ³³ EUA	Primary vaccination for 6 months through 5 years: two 0.25 mL (25 mcg) IM doses one month apart. ³³ Immunocompromised: as above, plus 3 rd dose one month after the second dose. ³³	N/A	Shipping/long-term storage (freezer): See footnote d. Refrigerator (2°C to 8°C): 30 days after thawing (prior to first use). ³³ After 30 days, contact manufacturer for guidance before discarding. ⁶ In-use vial/pre-drawn syringe: 12 hours. ^{10,33} Room temperature (8°C to 25°C): 24 hours total. Discard 12 hours after first puncture. ³³ Pre-drawn syringe: 12 hours after first puncture of source vial. ¹⁰	<ul style="list-style-type: none"> • Efficacy 36.8% (2 through 5 years of age) to 50.6% (6 through 23 months of age) against symptomatic infection (Omicron B.1.1.529-predominant period).³³ Also see footnote i. • See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about myocarditis/pericarditis.

VACCINE ^e	DOSE (Primary Series)	DOSE (Booster)	STORAGE/STABILITY	COMMENTS
<p>mRNA-1273 Bivalent Booster (original and Omicron BA.4/BA.5) (Moderna)/ mRNA</p> <p>DARK blue cap and a label with a GRAY border³</p> <p>EUA</p>	N/A	<p>Booster (6 through 11 years of age): one 0.25 mL IM dose ≥ 2 months after completion of primary series of any COVID-19 vaccine or booster.³</p> <p>Booster (≥ 12 years of age): one 0.5 mL IM dose ≥ 2 months after completion of primary series of any COVID-19 vaccine or booster.³</p>	<p>Shipping/long-term storage (freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C): 30 days after thawing (prior to first use).³ After 30 days, contact manufacturer for guidance before discarding.⁶ In-use vial: 12 hours.³ Pre-drawn syringe: 12 hours after first puncture of source vial.¹⁰</p> <p>Room temperature (8°C to 25°C): 24 hours total. Discard 12 hours after first puncture.³ Pre-drawn syringe: 12 hours after first puncture of source vial.¹⁰</p>	<ul style="list-style-type: none"> Approval based on immunogenicity data from a different bivalent booster (original and Omicron BA.1) in individuals ≥ 18 years of age.³ Also see footnote i.
<p>mRNA-1273 Bivalent Booster (original and Omicron BA.4/BA.5) (Moderna)/ mRNA</p> <p>Dark pink cap and a label with a YELLOW border.⁴¹</p> <p>EUA</p>	N/A	<p>Booster (6 months through 5 years of age): 0.2 mL IM dose ≥ 2 months after completion of a primary series with Moderna COVID-19 vaccine.⁴¹</p>	<p>Shipping/long-term storage (freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C): 30 days after thawing (prior to first use).⁴¹ After 30 days, contact manufacturer for guidance before discarding.⁶ In-use vial: 8 hours.⁴¹</p> <p>Room temperature (8°C to 25°C): 24 hours total. Discard 8 hours after first puncture.⁴¹</p>	<ul style="list-style-type: none"> Approval based comparison of immunogenicity data with patients 18 to 25 years of age.⁴¹ Also see footnote i.

VACCINE ^e	DOSE (Primary Series)	DOSE (Booster)	STORAGE/STABILITY	COMMENTS
<p>Ad26.COV2.S Janssen (J&J)/ Viral vector (non-replicating)</p> <p>EUA for adults for whom other vaccines are not available or appropriate, or if they refuse other vaccines.⁹</p>	<p>Primary vaccination for ≥18 years: one 0.5 mL IM dose.⁹</p> <p>Immunocompromised: as above, plus 2nd dose, (mRNA vaccine) ≥28 days later.²⁵</p>	<p>Booster: one 0.5 mL IM dose ≥2 months after primary vaccination (mRNA booster preferred).^{9,25}</p>	<p>Shipping/long-term storage (freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C): Up to 11 months, not to exceed manufacturer expiration date (unpunctured vial).³¹ In-use vial: 6 hours.⁹ Pre-drawn syringe: 6 hours after first puncture of source vial.^{9,10}</p> <p>Room temperature (9°C to 25°C): unpunctured vial: 12 hours.⁹ In-use vial: 2 hours.⁹ Pre-drawn syringe: 2 hours after first puncture of source vial.¹⁰</p>	<ul style="list-style-type: none"> • Efficacy 45.3% against symptomatic infection two to four months after mRNA booster (Omicron BA.1-predominant period).⁷ Also see footnote i. • See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about thrombosis with thrombocytopenia syndrome (TTS) and other rare side effects of viral vector COVID-19 vaccines.
<p>NVX-CoV2373 (Novavax)/ Recombinant protein subunit, adjuvanted</p> <p>EUA</p>	<p>Primary vaccination for ≥12 years of age: two 0.5 mL IM doses three weeks apart.¹⁴</p> <p>Immunocompromised: response may be diminished.¹⁴</p>	<p>Booster (≥18 years of age): one 0.5 mL IM dose ≥6 months after primary vaccination with any COVID-19 vaccine, for patients unable or unwilling to receive the bivalent mRNA booster.¹⁴</p>	<p>Refrigerator (2°C to 8°C): 6 hours (in-use vial or pre-drawn syringe).^{10,14}</p> <p>Room temperature (≤25°C): 6 hours (in-use vial or pre-drawn syringe).^{10,14}</p>	<ul style="list-style-type: none"> • Efficacy: See footnote i.

--Continue to the next page for the COVID-19 Vaccines Available in Canada chart.--

COVID-19 Vaccines Available in CANADA

VACCINE ^e	DOSE (Primary Series)	DOSE (Booster)	STORAGE/STABILITY	COMMENTS
<p>BNT162b2 (Pfizer-BioNTech)/ mRNA (Comirnaty)</p> <p>PURPLE cap¹⁸ (NOT for ages <12 years^a)</p> <p>Requires dilution with 1.8 mL NS per vial.¹⁸</p>	<p>Primary vaccination for ≥12 years: two 0.3 mL (30 mcg) IM doses 3 weeks apart (8-week interval preferred).^{18,20}</p> <p>Immunocompromised^f: As above plus 3rd dose, with 4 to 8 weeks between each of the three doses.^{18,20}</p>	<p>Bivalent booster preferred.^{20,h}</p> <p>Booster (≥12 years [approved for ≥16 years]).^h one 0.3 mL (30 mcg) IM dose ≥6 months (≥3 months in the event of heightened epidemiologic risk) after the primary series, booster, or infection.^{11,18}</p> <p>Immunocompromised^{f,h}: as above.²⁰</p>	<p>Shipping/long-term storage (ultra-low temp freezer, freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C): 1 month thawed/undiluted vials (includes transport [up to 12 hours]); 6 hours once diluted (vial or pre-drawn syringe).^{10,18}</p> <p>Room Temp (up to 25°C): 2 hours (thawed/undiluted); 6 hours (once diluted [vial or pre-drawn syringe]).^{10,18}</p>	<ul style="list-style-type: none"> • Efficacy: In adolescents, 43% effective against hospitalization 2 to 22 weeks after second dose (Omicron BA.1-predominant period).³⁶ Also see footnote i. • Lymphadenopathy (16%) may interfere with imaging (e.g., mammography) for four to six weeks after vaccination.²⁸ • See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about myocarditis/pericarditis.
<p>BNT162b2 (Pfizer-BioNTech)/ mRNA (Comirnaty)</p> <p>GRAY cap¹⁸ (NOT for ages <12 years^a)</p> <p>Do NOT dilute.¹⁸</p>	See above.	See above.	<p>Shipping/long-term storage (ultra-low temp freezer, freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C): 10 weeks (unpunctured vial).¹⁸ 12 hours (pre-drawn syringe).¹⁰</p> <p>Room Temp (up to 25°C): 12 hours (unpunctured vial or pre-drawn syringe).^{10,18} Discard vials 12 hours after first puncture.¹⁸</p> <p>Vaccine should not be used after 12 months from date of manufacture.¹⁸</p>	See above.

VACCINE ^e	DOSE (Primary Series)	DOSE (Booster)	STORAGE/STABILITY	COMMENTS
<p>BNT162b2 for 5 through 11 years of age (Pfizer-BioNTech)/mRNA (Comirnaty)</p> <p>ORANGE cap and label with orange border¹⁸</p> <p>Requires dilution with 1.3 mL of NS per vial.¹⁸</p>	<p>Primary vaccination for 5 to 11 years: two 0.2 mL (10 mcg) IM doses 21 days apart. (\geq8-week interval preferred).^{18,20}</p> <p>Immunocompromised: as above plus 3rd dose, with 4 to 8 weeks between each of the three doses.^{18,20}</p>	<p>First Booster: one 0.2 mL (10 mcg) IM dose \geq6 months after last primary dose.¹⁸</p>	<p>Shipping/long-term storage (ultra-low temp freezer, freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C) (option if vials arrive frozen or refrigerated): 10 weeks undiluted; 12 hours once diluted (vial).¹⁸</p> <p>Room Temp (up to 25°C): 12 hours (undiluted); 12 hours (once diluted [vial]).¹⁸</p> <p>Stable in pre-drawn syringe for 24 hours, with no more than 12 hours at room temperature (up to 30°C).¹⁰</p> <p>Vaccine should not be used after 12 months from date of manufacture.¹⁸</p>	<ul style="list-style-type: none"> • Efficacy 68% against hospitalization about one month after the second dose (Omicron BA.1-predominant period).³⁶ Also see footnote i. • See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about myocarditis/pericarditis.
<p>Pfizer-BioNTech Bivalent booster (original and Omicron BA.1) (original and Omicron BA.4/BA.5) for \geq12 years of age (Pfizer-BioNTech)/mRNA (Comirnaty)</p> <p>Do NOT dilute.^{39,40}</p>	<p>N/A</p>	<p>Booster (\geq12 years of age): one 0.3 mL IM dose \geq6 months (\geq3 months in the event of heightened epidemiologic risk) after the primary series, booster, or infection.^{11,39,40}</p>	<p>Shipping/long-term storage (ultra-low temp freezer, freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C): 10 weeks (unpunctured vial).^{39,40}</p> <p>Room Temp (up to 25°C): 12 hours (unpunctured vial).^{39,40}</p> <p>Discard vials 12 hours after first puncture.^{39,40}</p> <p>Vaccine should not be used after 12 months from date of manufacture.³⁹</p>	<ul style="list-style-type: none"> • Approval based on immunogenicity data in individuals $>$55 years of age.^{39,40} Also see footnote i.

VACCINE ^e	DOSE (Primary Series)	DOSE (Booster)	STORAGE/STABILITY	COMMENTS
<p>Pfizer-BioNTech Bivalent booster (original and Omicron BA.4/BA.5) for 5 through 11 years of age (Pfizer-BioNTech)/mRNA (Comirnaty)</p> <p>Orange cap⁴⁰</p> <p>Requires dilution with 1.3 mL of NS per vial.⁴⁰</p>	N/A	<p>Booster (5 through 11 years of age): one 0.2 mL IM dose ≥ 6 months (≥ 3 months in the event of heightened epidemiologic risk) after the primary series, booster, or infection.^{11,40}</p>	<p>Shipping/long-term storage (ultra-low temp freezer, freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C): 10 weeks (undiluted). 12 hours once diluted.⁴⁰</p> <p>Room Temp (up to 25°C): 12 hours (undiluted). 12 hours once diluted.⁴⁰</p> <p>Vaccine should not be used after 12 months from date of manufacture.⁴⁰</p>	<ul style="list-style-type: none"> Approval based on immunogenicity data of the bivalent original/Omicron BA.1 booster in individuals >55 years of age.⁴⁰ Also see footnote i.
<p>mRNA-1273 (Moderna)/mRNA (Spikevax)</p> <p>RED cap and label with a light blue border (0.2 mg/mL)²²</p> <p><i>Continued...</i></p>	<p>Primary vaccination for ≥ 12 years: two 0.5 mL (100 mcg) IM doses 1 month (4 weeks) apart (8-week interval preferred).^{20,22}</p> <p>6 to 11 years: two 0.25 mL (50 mcg) IM doses 4 weeks apart (≥ 8-week interval preferred).^{20,22}</p> <p>Immunocompromised^f: as above plus 3rd dose, with 4 to 8 weeks between each of the three doses.²⁰</p>	<p>If age ≥ 18 years, bivalent booster preferred.^{11,h}</p> <p>Booster (≥ 12 years^b): one 0.25 mL (50 mcg) IM dose ≥ 6 months (≥ 3 months in the event of heightened epidemiologic risk) after the primary series, booster, or infection.^{11,22}</p> <p>Immunocompromised^f: as above, but 100 mcg (0.5 mL) instead of 50 mcg (0.25 mL) can be used for first or second booster if ≥ 18 years.²⁰</p>	<p>Shipping/long-term storage (freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C): 30 days after thawing (prior to first use).²²</p> <p>In-use vial: 24 hours.²² Pre-drawn syringe: 12 hours from first puncture of source vial.¹⁰</p> <p>Room temperature (8°C to 25°C): unpunctured or in-use vial: 24 hours total.^{12,22} Pre-drawn syringe: 12 hours from first puncture of source vial.¹⁰</p>	<ul style="list-style-type: none"> Efficacy: In children 12 through 17 years of age, 93.3% effective in preventing symptomatic infection (pre-Omicron data).² Also see footnote i. Lymphadenopathy (16%) may interfere with imaging (e.g., mammography) for four to six weeks after vaccination.²⁸ See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about myocarditis/pericarditis.

VACCINE ^e	DOSE (Primary Series)	DOSE (Booster)	STORAGE/STABILITY	COMMENTS
<i>Spikevax</i> , continued				<ul style="list-style-type: none"> Delayed-type hypersensitivity reaction (e.g., large, red area near injection site) reported most often about a week after first shot. May be itchy, painful, warm, or swollen, and can also involve fingers, elbow, or palm. Not a contraindication to subsequent vaccination.¹⁵
<p>mRNA-1273 (Moderna)/ mRNA (Spikevax)</p> <p>ROYAL blue cap and a label with a PURPLE border²² (0.1 mg/mL)</p> <p>Approved for primary series (6 months through 11 years) and 50 mcg booster (adults)²²</p>	<p>Primary vaccination for 6 months through 5 years: two 0.25 mL (25 mcg) IM doses 4 weeks apart (≥8 weeks preferred).^{22,35}</p> <p>Primary vaccination for 6 through 11 years: two 0.5 mL (50 mcg) IM doses 4 weeks apart (≥8 weeks preferred).^{20,22}</p> <p>Immunocompromised: as above plus 3rd dose, with 4 to 8 weeks between each of the three doses.^{20,35}</p>	<p>Bivalent booster preferred if ≥18 years of age.^{11,h}</p> <p>Booster (≥18 years): one 0.5 mL (50 mcg) IM dose ≥6 months (≥3 months in the event of heightened epidemiologic risk) after the primary series, booster, or infection.^{11,20} See footnote j.</p>	<p>Shipping/long-term storage (freezer): See footnote d.</p> <p>Refrigerator (2°C to 8°C): 30 days after thawing (prior to first use).²² In-use vial: 24 hours.²²</p> <p>Room temperature (8°C to 25°C): in-use vial: 24 hours.²²</p>	<ul style="list-style-type: none"> Efficacy 36.8% (2 through 5 years of age) to 50.6% (6 through 23 months of age) against symptomatic infection (Omicron B.1.1.529-predominant period).³³ Also see footnote i. See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about myocarditis/pericarditis.

VACCINE ^e	DOSE (Primary Series)	DOSE (Booster)	STORAGE/STABILITY	COMMENTS
mRNA-1273 Bivalent Booster (original and Omicron BA.1) (original and Omicron BA.4/BA.5) (Moderna)/mRNA (<i>Spikevax Bivalent</i>)	N/A	Booster (≥18 years of age): one 0.5 mL IM dose ≥6 months (≥3 months in the event of heightened epidemiologic risk) after the last COVID-19 vaccine dose or infection. ^{1,11,42}	Shipping/long-term storage (freezer): See footnote d. Refrigerator (2°C to 8°C): 30 days after thawing (prior to first use). ^{1,42} In-use vial: 24 hours. ^{1,42} Room temperature (8°C to 25°C): 24 hours total, in-use or unpunctured. ^{1,42}	<ul style="list-style-type: none"> Approval based on immunogenicity data.¹ Also see footnote i.
Ad26.COV2.S Janssen (J&J)/ Viral vector (non-replicating) (<i>Jcovden</i>) mRNA vaccine preferred. ²⁰	Primary vaccination for ≥18 years: one 0.5 mL IM dose. ²⁴ Immunocompromised: as above, plus 2 nd dose, (mRNA vaccine) ≥28 days later. ²⁰	Bivalent booster preferred. ^{11,h} First Booster (only when all other vaccines are contraindicated): ≥2 months after the first dose. ^{11,24}	Shipping/long-term storage (freezer): See footnote d. Refrigerator (2°C to 8°C): up to 11 months, not to exceed manufacturer expiration date (unpunctured vial). ²⁴ In-use vial/pre-drawn syringe: 6 hours. ^{10,24} Room temperature (9°C to 25°C): unpunctured vial: 12 hours. ²⁴ In-use vial: 3 hours. ²⁴ Pre-drawn syringe: 2 hours. ¹⁰	<ul style="list-style-type: none"> Efficacy: See footnote i. See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about thrombosis with thrombocytopenia syndrome (TTS) and other rare side effects of viral vector COVID-19 vaccines.
ChAdOx1-S (AstraZeneca)/ Viral vector (non-replicating) (<i>Vaxzevria</i>) mRNA vaccine preferred. ²⁰	Primary vaccination for ≥18 years of age: two 0.5 mL IM doses 4 to 12 weeks apart (≥8-week interval preferred). ^{16,20} Immunocompromised: As above plus 3 rd dose (mRNA vaccine) ≥28 days later. ²⁰	N/A	Refrigerator (2°C to 8°C): manufacturer expiration date (unpunctured vial); 48 hours (in-use vial). ¹⁶ Room temperature (≤30°C): 6 hours (in-use vial). Vial can be re-refrigerated, but the cumulative storage at room temperature cannot exceed 6 hours, and the total cumulative storage time cannot exceed 48 hours. ¹⁶	<ul style="list-style-type: none"> Efficacy: See footnote i. See our FAQ, <i>Communicating About COVID-19 Vaccination</i>, for information about thrombosis with thrombocytopenia syndrome (TTS) and other rare side effects of viral vector COVID-19 vaccines.

VACCINE ^e	DOSE (Primary Series)	DOSE (Booster)	STORAGE/STABILITY	COMMENTS
NVX-CoV2373 (Novavax)/ Recombinant protein subunit, adjuvanted (<i>Nuvaxovid</i>) mRNA vaccine preferred. ²⁰	Primary vaccination for ≥12 years of age: two 0.5 mL IM doses three weeks apart (8-week interval preferred). ^{8,20} Immunocompromised^f: As above, plus 3rd dose, with 4 to 8 weeks between each of the three doses (mRNA vaccine preferred). ²⁰	Bivalent booster preferred. ^{11,h} Booster (≥18 years of age): one 0.5 mL IM dose ≥6 months (≥3 months in the event of heightened epidemiologic risk) after the last COVID-19 vaccine dose or infection. ^{8,11}	Refrigerator (2°C to 8°C): 6 hours (in-use vial or pre-drawn syringe). ^{8,10} Room temperature (≤25°C): 6 hours (in-use vial or pre-drawn syringe). ^{8,10}	<ul style="list-style-type: none"> Effectiveness estimates unknown for current variants.²⁰ Also see footnote i.
Covifenz (Medicago)/ Recombinant spike protein in plant-based virus-like particles, adjuvanted mRNA vaccine preferred. ²⁰	Primary vaccination for 18 to 64 years of age: two 0.5 mL IM doses 21 days apart (8-week interval preferred). ^{20,26} Immunocompromised^f: As above, plus 3rd dose, with 4 to 8 weeks between each of the three doses (mRNA vaccine preferred). ²⁰	N/A	Refrigerator (2°C to 8°C): Until expiration date on vaccine and adjuvant vials (unpunctured). ²⁶ In-use vial (mixed): 20°C to 30°C for 6 hours (do not refrigerate once mixed). ²⁶	<ul style="list-style-type: none"> Effectiveness estimates unknown for current variants.²⁰ Also see footnote i. Requires mixing of adjuvant and antigen before use (see product labeling for instructions).²⁶ Produced using the genomic sequence of the spike protein of the original strain.²⁶ May contain trace amounts of kanamycin or carbenicillin.²⁶

- The adult formulation of the Pfizer-BioNTech vaccine **CANNOT** be used for children <12 years of age by using a dose-adjusted volume. This is because the resulting volume is too small for an intramuscular injection.²⁹
- Canada:** For Moderna, 100 mcg (0.5 mL) instead of 50 mcg can be used as the booster in high-risk adults.²⁰
- Comirnaty** and the Pfizer-BioNTech COVID-19 vaccine authorized (EUA) for ages ≥12 years of age (purple and gray cap vials) can be used interchangeably when prepared according to their respective instructions for use.²⁵

- d. See product labeling for storage in ultra-low freezer, freezer, and thawing before use, if applicable.
- e. Tips to **minimize vaccine waste** include:^{10,23}
- Maintain the cold chain to prevent waste due to inappropriate storage conditions.
 - Maximize doses drawn from multidose vials using:
 - low dead-volume syringes/needles.
 - techniques to minimize leakage (e.g., multiple puncture locations in the rubber stopper, instead of the same location over and over [this can create a larger hole]).
 - Draw up an appropriate number of syringes based on expected vaccination appointments for the day.
 - Monitor appointment cancellations and no shows throughout the day. Then draw up afternoon doses based on the revised appointment list.
 - Use syringes in order of expiration time, starting with the earliest expiration date.
 - Maintain a waiting list to contact people at the end of the day if there are extra doses available.
- f. **US:** Immunocompromise = solid organ transplant patients or similar level of immunocompromise. For a full list of CDC-recommended conditions, see <https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html#immunocompromised>.
Canada: See a full list of **immunocompromising conditions**, see the Canadian Immunization Guide: <https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-3-vaccination-specific-populations/page-8-immunization-immunocompromised-persons.html>. **Ontario** Ministry of Health recommendations for the third dose are available at https://www.health.gov.on.ca/en/pro/programs/publichealth/coronavirus/docs/vaccine/COVID-19_vaccine_third_dose_recommendations.pdf.
- g. **Spikevax** and the authorized (EUA) **RED** cap Moderna COVID-19 vaccine with a label with a light blue border can be used interchangeably to provide primary series doses or booster doses.²
- h. Bivalent booster (age-appropriate) preferred, regardless of the number of booster doses previously received, and can be offered to all individuals ≥ 12 years of age, especially those at increased risk.¹¹
- i. **Efficacy:** Absolute efficacy of the bivalent booster against **hospitalization** vs receiving no previous COVID-19 vaccine doses was 84% (95% CI 64% to 93%) in one US cohort.⁴ Absolute efficacy of the bivalent booster **against infection** vs receiving no previous COVID-19 vaccine doses varied based on age and number of previous monovalent doses and ranged from 19% to 50%.⁵ The bivalent booster was also more effective than previous vaccination with the monovalent booster in regard to preventing infection and hospitalization.^{4,5} Note that many of the patients with no previous doses probably had at least some natural immunity. For the most current CDC-authored vaccine effectiveness studies, see COVID-19 Vaccine Effectiveness Monthly Update at <https://covid.cdc.gov/covid-data-tracker/#vaccine-effectiveness>.

Abbreviations: EUA = Emergency Use Authorization; IM = intramuscular; NS = normal saline; UK = United Kingdom.

The CDC has interim recommendations for **COVID-19 vaccine administration errors and deviations** available at <https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us-appendix.html#appendix-d>.

Fact Sheets and Product Labeling

- *Comirnaty* (PURPLE cap) prescribing information (US): <https://www.fda.gov/vaccines-blood-biologics/comirnaty>
- *Comirnaty* (GRAY cap) prescribing information (US): <https://www.fda.gov/vaccines-blood-biologics/comirnaty>
- Pfizer-BioNTech vaccine EUA fact sheet (**12 years of age and older**) for healthcare professionals (US): <https://www.fda.gov/media/153713/download>

- Pfizer-BioNTech vaccine EUA fact sheet (**12 years of age and older [including bivalent booster]**) for patients (US): <https://www.fda.gov/media/153716/download>
- Pfizer-BioNTech vaccine EUA fact sheet (**12 years of age and older-Do Not Dilute**) for healthcare professionals (US): <https://www.fda.gov/media/153715/download>
- Pfizer-BioNTech vaccine EUA fact sheet (**5 through 11 years of age**) for healthcare professionals (US): <https://www.fda.gov/media/153714/download>
- Pfizer-BioNTech vaccine EUA fact sheet (**5 through 11 years of age [including bivalent booster]**) for patients (US): <https://www.fda.gov/media/153717/download>
- Pfizer-BioNTech vaccine EUA fact sheet (**6 months through 4 years of age [including bivalent booster]**) for healthcare professionals (US): <https://www.fda.gov/media/159312/download>
- Pfizer-BioNTech vaccine EUA fact sheet (**6 months through 4 years of age**) for patients (US): <https://www.fda.gov/media/159313/download>
- Pfizer-BioNTech vaccine EUA fact sheet (**booster dose for 12 years of age and older**) for healthcare professionals (US): <https://www.fda.gov/media/161327/download>
- Pfizer-BioNTech vaccine EUA fact sheet (**booster dose for 5 through 11 years of age**) for healthcare professionals (US): <https://www.fda.gov/media/162250/download>
- *Spikevax* prescribing information (US): <https://www.fda.gov/vaccines-blood-biologics/spikevax>
- Moderna vaccine EUA fact sheet for healthcare professionals (US) (**Primary series, ≥12 years of age**): <https://www.fda.gov/media/157233/download>
- Moderna vaccine EUA fact sheet for healthcare professionals (US) (**Bivalent booster, adults**): <https://www.fda.gov/media/161318/download>
- Moderna vaccine EUA fact sheet for patients (US) (**12 years of age and older [including bivalent booster]**): <https://www.fda.gov/media/144638/download>
- Moderna vaccine EUA fact sheet for healthcare professionals (US) (**6 through 11 years of age**): <https://www.fda.gov/media/159308/download>
- Moderna vaccine EUA fact sheet for patients (US) (**6 years of age and older [primary series and bivalent booster]**): <https://www.fda.gov/media/159310/download>
- Moderna vaccine EUA fact sheet for healthcare professionals (US) (**6 months through 5 years of age**): <https://www.fda.gov/media/159307/download>
- Moderna vaccine EUA fact sheet for patients (US) (**6 months through 5 years of age [primary series and bivalent booster]**): <https://www.fda.gov/media/159309/download>
- Moderna vaccine EUA fact sheet for healthcare professionals (US) (**Bivalent booster, 6 months through 5 years of age**): <https://www.fda.gov/media/163785/download>
- Moderna vaccine EUA fact sheet for patients (US) (**Bivalent booster, 6 months through 5 years of age**): <https://www.fda.gov/media/159309/download>
- Janssen (J&J) vaccine EUA fact sheet for healthcare professionals (US): <https://www.fda.gov/media/146304/download>
- Janssen (J&J) vaccine fact sheet for patients (US): <https://www.fda.gov/media/146305/download>
- Novavax vaccine EUA fact sheet for healthcare professionals (US): <https://www.fda.gov/media/159897/download>
- Novavax vaccine fact sheet for patients (US): <https://www.fda.gov/media/159898/download>
- Current Canadian product monographs for Covid-19 vaccines available in Canada can be found at Health Canada's Drug Product Database (<https://health-products.canada.ca/dpd-bdpp/index-eng.jsp>).

Users of this resource are cautioned to use their own professional judgment and consult any other necessary or appropriate sources prior to making clinical judgments based on the content of this document. Our editors have researched the information with input from experts, government agencies, and national organizations. Information and internet links in this article were current as of the date of publication.

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